

**EPA Superfund
Explanation of Significant Differences:**

**E.I. DU PONT DE NEMOURS & CO., INC. (NEWPORT
PIGMENT PLANT LANDFILL)
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SOUTH LANDFILL EXPLANATION OF SIGNIFICANT DIFFERENCES E.I. DuPONT, NEWPORT SUPERFUND SITE NEW CASTLE COUNTY, DELAWARE

EPA ANNOUNCES A CHANGE IN THE REMEDY FOR THE SOUTH LANDFILL

INTRODUCTION AND STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) describes a change in the remedy to address contamination in the south landfill area of the E.I. DuPont, Newport Superfund Site ("DuPont-Newport Site" or the "Site") which is located in Newport, New Castle County, Delaware. The U.S. Environmental Protection Agency (EPA) is the lead agency for the Site and the Delaware Department of Natural Resources and Environmental Control (DNREC) is the support agency. This action is taken pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. § 117(c), and Section 300.435(c)(2)(1) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

On August 26, 1993, the Environmental Protection Agency (EPA) issued a Record of Decision (ROD) for this Site formally outlining how EPA would address the Site contamination. The ROD discussed seven areas of the Site: a ballpark, the north landfill and wetlands, the south landfill, the south wetlands, the Christina River, the Ciba Specialty Chemicals and DuPont Holly Run chemical plants, and the ground water. As stated above, this ESD pertains to the south landfill area at the Site.

In October 1993, new information was presented to EPA regarding the volume of waste in the south landfill. EPA was presented with several new alternatives that could address the risks from the contamination in the south landfill. On August 16, 1995 EPA issued an ESD revising the original remedy from *in-situ* soil stabilization to *in-situ* chemical precipitation with hydraulic containment of the waste materials.

Subsequent to the issuance of the 1995 ESD, further information developed during design showed that chemical precipitation may not have worked as well as originally expected and that the cost was going to be significantly higher than originally thought. As a result, in January 2001 a new alternative was formally submitted to EPA by DuPont to address the risks from the contamination in the south landfill. EPA compared this new alternative (the use of a permeable reactive barrier wall [PRB] to treat contaminants in the ground water to the

previously two selected alternatives, soil stabilization and chemical precipitation, to determine if any change should be made.

Based on its review of the new information, EPA believes that it should change the *in-situ* chemical precipitation approach to remediate the south landfill, to a different type of treatment technology. This ESD describes a new revised treatment remedy for the south landfill and explains why EPA is making this change. These changes do not fundamentally alter the previously selected remedy for the south landfill with respect to scope or performance. Therefore, a ROD amendment is not required and the change can be effected through this ESD.

The Administrative Record file, which contains the information upon which EPA based this remedy change, is being made available at the following information repositories:

U.S. EPA Region III
6th Floor Public Reading Room
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3157

The Kirkwood Library
6000 Kirkwood Highway
Wilmington, DE 19808
(302) 995-7663

Town Hall of Newport
15 N. Augustine St.
Newport, DE 19804
(302) 994-6403

SITE DESCRIPTION AND BACKGROUND

The DuPont-Newport Superfund Site occupies approximately 120 acres on the banks of the Christina River at James and Water Streets in Newport, Delaware. It is near the I-95, I-495, and Delaware State 141 interchange (see Figure 1). The Site includes land currently occupied by a paint pigment production facility (the Ciba Specialty Chemicals plant), the location of a former chromium dioxide production facility (the DuPont Holly Run plant), two industrial landfills separated by the Christina River (known locally by some as the Christiana River), and a baseball diamond (owned by DuPont and referred to as the ballpark) located just northwest of the Ciba plant across the Amtrak railroad (see Figure 2). Part of the Site is in the town of Newport and part of the Site is in unincorporated New Castle County.

Originally built during the period from 1900 to 1902, the pigment plant was owned and operated by Henrik J. Krebs. The plant produced Lithopone, a white inorganic paint pigment. E.I. du Pont de Nemours & Company (DuPont) purchased the plant in 1929 and continued to

produce Lithopone, but slowly changed and added processes to produce other organic and inorganic pigments. DuPont sold the pigment manufacturing operations to Ciba-Geigy Corporation in 1984.

As part of the pigment plant operations (prior to Ciba's ownership), waste and off-specification products were disposed of in the north and south landfills. The south landfill, which operated from approximately 1902 to 1953, was used for the disposal of large quantities of Lithopone wastes. Waste sludges from the purification of zinc and barium ores were pumped from the plant and discharged into the south wetlands, creating a landfill. The waste sludges contained numerous heavy metal contaminants. In the 1970's, the south landfill was covered with soils from excavations for the construction of the Delaware Highway 141 Christina River bridge.

Results of ground water samples collected in the late 1970's and early 1980's, indicated elevated levels of heavy metals (especially barium, cadmium, and zinc) and volatile organic compounds (mainly tetrachloroethene and trichloroethene) in the ground water. The Site was proposed to be included on the National Priorities List (NPL) in January 1987. It was added to the NPL in February 1990.

On August 22, 1988, DuPont entered into an Administrative Order by Consent with EPA. This meant that DuPont agreed to perform a Remedial Investigation and Feasibility Study (RI/FS) for the Site, which led to the August 26, 1993 ROD.

Attached are Figures 3, 4, and 5 from the ROD. Figure 3 contains data from soil samples from across the Site including sample TP-6, located in the south landfill, which shows high levels of contamination. Figures 4 and 5 show that the landfill extends to the east of where James Street/Basin Road is located today. James Street/Basin Road, which once formed the border of the landfill, was relocated to accommodate construction of the Delaware State Highway 141 bridge.

In 1993, the Delaware Department of Transportation (DelDOT) collected a number of soil samples from the portion of the south landfill owned by the State of Delaware (currently underneath and to the east of James Street/Basin Road). DelDOT did this to more accurately determine the amount and extent of soil contamination. Figure 6 shows DelDOT's boring locations and Figure 7 shows some of the sample results. Data collected by DelDOT indicated that 85,000 cubic yards (instead of the 37,000 cubic yards estimated in the ROD) would require excavation, because the contamination was deeper than originally anticipated, representing a significant increase in the overall amount of waste requiring treatment and increase in cost.

In 1994, DelDOT and DuPont independently submitted alternate remedy proposals to the EPA in an effort to address the contamination in a less costly manner. In 1995, EPA selected an alternate remedy for the south landfill and issued an Explanation of Significant Differences (1995 ESD) to modify the 1993 ROD. The revised remedy changed the treatment technology from *in-situ* stabilization to *in-situ* chemical precipitation with sodium sulfide and sodium sulfate. The 1995 ESD also upgraded the containment system from just a soil cover to a low

permeability cap, a circumscribing ground water barrier wall, and a ground water pump and treat system (see Figure 9 for a depiction of the 1995 ESD remedy).

Subsequent to the issuance of the 1995 ESD, further information developed during the design showed that the chemical precipitation may not have worked as well as originally expected. Although tests showed a number of contaminants would become less mobile in the ground water (the goal of the treatment), there were indications that other contaminants could become more mobile. Also, the cost was going to be significantly higher than originally thought because the amount of treatment chemicals required had been underestimated. As a result, DuPont presented a new alternative to EPA to address the risks from the contamination in the south landfill.

REMEDY CHANGE

The 1995 ESD remedy called for *in-situ* precipitation of the south landfill wastes by using sodium sulfate and sodium sulfide as treatment agents. The original estimate of the amount of reagents required for treatment was 82 tons. Current estimates indicate that 34,000 tons of reagents are actually necessary and would cause a 5 percent increase in the total volume of waste materials. The original estimated cost of the south landfill portion of the selected 1995 ESD remedy was \$11,600,000. Based on the new estimate of the materials required for treatment, the revised cost estimate for this work is \$23,110,000.

In January 2001, DuPont presented an new alternative treatment remedy to address the south landfill. After careful review by EPA and Delaware Department of Natural Resources and Environmental Control (DNREC), EPA is selecting this change to the remedy at the south landfill. EPA has determined that this is a significant change to the remedy at the south landfill, but a change that does not fundamentally alter the remedy selected in the ROD. The ROD remains protective of human health and the environment and continues to meet applicable or relevant and appropriate requirements (ARARs). The revised remedy involves changing the treatment technology from chemical precipitation with sodium sulfate and sodium sulfide to a PRB treatment technology¹ that is coupled with a low-permeability ground water barrier wall and a landfill cap. This remedy eliminates the ground water pump-and-treat requirement.

DESCRIPTION OF THE REVISION TO THE REMEDY

The revision to the remedy for the south landfill includes a complete barrier system to physically separate the waste material from the environment. The barrier system will consist of a low-permeability (1×10^{-7} cm/s or less) slurry wall coupled with a permeable reactive barrier wall and a synthetic cap, as shown in Figure 10. The slurry wall will be placed parallel to the Christina River along the south side of the 6 foot-diameter New Castle County sewer main that runs through the landfill, and the PRB wall will surround the remainder of the landfill. Both

¹This type of technology is used to remove contamination from groundwater while it is still in the ground by installing a permeable "reactor" into the ground through which the contaminated ground water flows. Treatment takes place in the installed permeable zone.

barriers will be tied into the relatively impermeable marsh deposit below the landfill (see Figures 11 and 12). The slurry wall and reactive barrier will circumscribe, to the extent practicable, all of the waste material within the south landfill, including the portion on the State's property, as shown in Figure 10. To prevent possible damage to the sewer line by trying to install the ground water barrier wall and/or PRB across the pipe, the sewer line and the waste material between the sewer line and the river bank will not be within this containment. However, as described below, the cap will cover this waste material as well.

The riverbank will be capped by clearing existing vegetation, extending the synthetic cap to the low mean tide (-1.6 ft MSL) elevation, and covering the riverbank with armor stone. The slurry wall, engineered cap, and riverbank cap will prevent further migration of ground water through the waste material not contained within the circumscribing slurry/reactive wall structures. The riverbank stabilization measures will also prevent further erosion of waste material.

The slurry wall will be 36-inches wide with a 3-foot key into the clayey-silt marsh deposit. The permeable reactive barrier (18-inches wide²) will be a mixture of treatment agents and clean sand in the weight ratio of 100:20:5:5 (DeIDOT mortar sand: gypsum: iron: magnesite).

All ground water originating in the waste material will pass through the permeable barrier for treatment. The PRB is designed to reduce soluble metals concentrations to below the following levels:³

Barium	7800	ppb*
Cadmium	4	ppb
Copper	18	ppb
Lead	15	ppb
Manganese	1,000	ppb
Nickel	730	ppb
Zinc	120	ppb

* ppb = parts per billion

²Based on field studies at the south landfill, an 18-inch thick wall is very conservatively estimated to have a greater wall life than 260 years.

³The 1995 ESD stated that "most of these concentrations represent the lower of either the acute ambient water quality criteria or a level generally considered acceptable to drink. The acute ambient water quality criteria is consider protective because of the waiver, already contained in the ROD, of chronic levels and the fact that because of ground water recovery well operation, any leakage through the barrier wall will be into the containment system. The above concentrations must be met at each of the extraction wells and monitoring locations." While this rationale is no longer directly applicable because, instead of extraction wells removing this water and sending it to a treatment plant, the water is migrating directly to the wetlands, these criteria are still protective of the environment since, due to the low amount of water migrating from the landfill, the overall amount of metals that will migrate from the landfill to the wetlands is so low that the metals do not pose a threat to the wetland sediments or surface water.

Within the reactive wall, the iron will immobilize soluble zinc via surface adsorption reactions. The gypsum and magnesite will immobilize soluble barium and manganese as barium sulfate and manganese carbonate precipitates, respectively. The treatment will not specifically target cadmium, copper, lead, and nickel; however, the concentrations for these metals already meet the above criteria.

Two additional contaminants of concern, arsenic and chromium, are also not expected to be impacted by the PRB treatment. Chromium concentrations are already below levels considered protective and do not warrant further treatment. Recent sampling results indicated that arsenic is also below levels considered protective of human health and the environment.

Monitoring wells placed inside the permeable reactive barrier (see Figure 10) will confirm ground water treatment and provide an early warning against premature wall breakthrough to ensure protection of human health and the environment. Approximately 10 monitoring wells (on 200 foot centers) will be installed in the outside six inches of the barrier. In addition, some down gradient wells will be installed to observe metals attenuation.

An engineered cap will cover all of the waste material and extend beyond the limits of the slurry wall and reactive barrier including to the mean low tide line of riverbank. The cap will have a maximum permeability of 1×10^{-7} cm/sec and will be designed as shown in Figure 11. The design includes a synthetic geomembrane layer with a geosynthetic clay liner underneath, a drainage layer, protective soil, topsoil and vegetation.

As in the 1995 ESD remedy, additional fencing and a vegetative barrier (perhaps thorny plants) will be installed (as needed) around the entire south landfill area including the adjacent wetland areas. This will help provide better site security to control trespassing. Institutional controls include a notification attached to the deed regarding past land use and restrictions on future land use. Health and safety requirements for maintenance workers of the sewer main and highway workers will be established.

The present worth cost of this change in the remedy for the south landfill is \$5,050,000 (see Table 16B [replaces Table 16A in the 1995 ESD]), adjusting the overall cost of the remedy in the 1993 ROD from \$47,700,000 to \$38,450,000. For a complete listing of the applicable or relevant and appropriate requirements (ARARs) for this change, see the attached Table 12B (replaces Table 12A in the 1995 ESD). Also attached are Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12.

RATIONALE FOR SELECTION OF THIS CHANGE TO THE REMEDY FOR THE SOUTH LANDFILL

The above alternative was evaluated in detail and compared to the previously selected 1993 ROD and 1995 ESD remedies in order to determine which would be the most effective in achieving the goals of CERCLA and in achieving the remedial action objectives for the Site. EPA uses nine criteria, which are summarized in Table 1, to guide remedy selection. The first two criteria (overall protection of human health and the environment and compliance with

applicable or relevant appropriate requirements [ARARs]) are threshold criteria and must be met by the chosen site remedy (except when an ARAR waiver is invoked). The next five criteria (long-term effectiveness and performance; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are the primary balancing criteria. The remaining two criteria (state acceptance and community acceptance) are referred to as modifying criteria.

Below is a comparison of the revised remedy for the south landfill to the previously selected remedies for that area of the Site using the EPA's nine criteria.

Overall Protection of Human Health and the Environment

The ROD stated:

In summary, based on the potential impacts to human health and the environment, EPA has determined that the following areas of the Site warrant remediation:

South landfill: This area continually releases contaminants to the ground water in the fill zone and/or Columbia aquifers which affects shallow ground water in the direction of migration and ground water discharge areas. The two discharge points are the river and the south wetlands which have AWQC (ambient water quality criteria) or SWQS (State water quality standards) exceedances and some sediments which exhibit unacceptable environmental impacts. Future subsurface maintenance or construction activities would result in unacceptable risks to humans.

This newly revised remedy offers the same degree of overall protection to human health and the environment as the original 1993 ROD remedy or the 1995 ESD remedy. Each of the three alternatives has various aspects that make it better than the other two in regard to protectiveness. In the original ROD remedy, the stabilized waste would continue to leach small amounts of contaminants to the river and wetlands because the waste would not be isolated from the surrounding environment. The 1995 ESD remedy includes a complete containment system that would isolate the waste materials from the surrounding environment even if the treatment did not work. The PRB remedy incorporates a reactive barrier as part of the circumscribing wall which is a passive treatment system, relying upon the natural flow of ground water and *in-situ* processes to treat the contaminated ground water and is not dependent upon the continuous operation of a mechanical extraction and treatment system. Contaminated water from inside the landfill will be treated as it flows through the permeable reactive barrier wall. In the unlikely event that the soil cover and cap fail, the PRB would continue to treat fluids exiting the landfill, safeguarding against releases to the surrounding environment. Extending the cap to the riverbank ensures long-term containment of landfill material outside of the slurry wall and sewer line.

Sewer line workers and highway workers will be protected by special health and safety measures.

Compliance with ARARS

The ROD, the 1995 ESD, and this change to the remedy for the south landfill meet all ARARs associated with the south landfill. Most of the ARARs for the south landfill are related to the protection of wetlands, with the exception of the Resource Conservation and Recovery Act (RCRA) Subtitle D closure requirements (relevant and appropriate for the 1993 ROD remedy) and Delaware Regulations Governing Solid Waste (see Table 12B). Care will be taken during the design and construction of the revised remedy to prevent any adverse effects in the south wetlands and the Christina River.

Long-term Effectiveness and Performance

This change to the remedy for the south landfill offers a greater degree of long-term effectiveness when compared to the 1995 ESD remedy but somewhat less than the remedy described in the 1993 ROD. This revision is designed for long-term (hundreds of years) immobilization of metals by treatment materials that are either slightly soluble (gypsum and magnesite) or insoluble (iron). The 1995 ESD treatment agents are very soluble, hence susceptible to flushing from the waste by infiltration if the cap were to fall. Due to the differences in solubility of the reactive materials in the two remedies, the revised remedy treatment performance is not as dependent upon the cap integrity as the 1995 ESD remedy. Should the revised remedy cap fail, infiltrated water would merely flow through the reactive barrier and be treated. Placing monitoring wells within the barrier provides decades of advance warning to ensure contaminants are treated and contained. The 1995 ESD remedy also requires the continuous operation and maintenance of a ground-water extraction and treatment system to ensure waste containment and remedy success. Downtime or failure experienced by this pump-and-treat system could impact the performance and effectiveness of the 1995 ESD remedy. The effectiveness of the revised remedy is not dependent upon external mechanical systems.

The original remedy, which stabilized the waste, offers the best degree of long-term effectiveness because treatment is not an on-going process. However, long-term weathering of the stabilized mass could result in increasing amounts of contaminants being released to the environment.

Reduction of Toxicity, Mobility, or Volume through Treatment

The original ROD remedy, the 1995 ESD remedy, and this revision each would significantly reduce the mobility of the metals through treatment. The ROD remedy and the 1995 ESD change would, however, increase the total waste volume at the south landfill. This selected revised remedy will immobilize migrating metals via precipitation and adsorption reactions within the treatment matrix, with no net increase in waste volume. This will aid the design and construction of the treatment remedy and will minimize any decrease in floodplain volume. Another disadvantage of the 1995 ESD remedy is that its ground-water treatment system would generate additional waste materials that would require off-site disposal. This revised remedy will not generate any additional waste materials.

Short-term Effectiveness

This change in the remedy for the south landfill ranks better than the original remedy and the 1995 ESD remedy in short-term effectiveness. This revised remedy is expected to take less than one year to construct rather than the two years for the 1995 ESD and 1993 ROD remedies. This revised remedy will not disturb the existing soil cover until the cap is installed (at which time soil grading activities may disturb part of the current soil cover), reducing potential risks for environmental releases and exposure to the waste materials during construction. Impacts to traffic along South James Street/Basin Road would be reduced under the revised remedy. The 1995 ESD required installation of a dual-barrier cap under South James Street. This would have required extensive efforts to prevent road closure (including possible construction of a temporary roadway). This revision to the remedy makes it much easier to allow uninterrupted travel, except possibly during a few hours when the vertical barrier crossings are made (and even this can be done at times to eliminate or minimize disruptions to the local businesses).

Implementability

The original ROD remedy, the 1995 ESD remedy, and the revised remedy are all implementable. However, this change to the south landfill remedy is easier to implement due to its shorter construction period, use of proven construction methods, and very little impact to the travel lanes of South James Street. Also, this revised remedy only involves treatment at the edge of the waste rather than throughout the waste material such that only a small percentage of work is below the surface.

Cost

This revision to the remedy is much less expensive than the 1995 ESD or the 1993 ROD remedies. Utilizing the current estimates of the volume of contaminated soil, this change has a present worth cost of \$5,050,000 compared to \$17,370,000 for the original 1993 ROD remedy and \$23,110,000 for the 1995 ESD remedy, (estimated to be \$33,500,000 and \$11,600,000 respectively in the August 16, 1995 ESD).

State Acceptance

The State of Delaware supports the remedy change (see attached letter).

Community Acceptance

Although no public comment period has been held (because no fundamental changes to the ROD are being made), community acceptance of this remedy change is judged to be high. Some of the main concerns previously expressed by the public include the high cost of the remedy and the impacts to traffic along South James Street/Basin Road. The revised remedy is less costly and will incur fewer impacts to local traffic.

EPA is making this ESD available to the public in the Administrative Record established for the Site at the above referenced repositories. EPA is also publishing a notice in the Wilmington News Journal summarizing this change to the remedy for the south landfill, including reasons why this change is being made.

PERFORMANCE STANDARDS

Section 3 of the “Detailed Description and Performance Standards” portion of the August 26, 1993 ROD contains the performance standards for the south landfill. The performance standards in the ROD were modified by the 1995 ESD. The performance standards listed below are the complete set of Section 3 from the Performance Standards in the 1993 ROD (as modified by the 1995 ESD). When an existing Performance Standard has been modified (rather than deleted), the modifications are indicated by italics and/or “strikeout”. The changes to the Performance Standards are incorporated into the ROD by issuance of this ESD.

- 3.1 **Excavation of the Basin Road Area** – The Performance Standards relating to this work were deleted in the 1995 ESD.
- 3.2. **In-Situ Stabilization** – The Performance Standards relating to this work were deleted in the 1995 ESD.
- 3.3. **South Landfill Cap**

DESCRIPTION: (Replaces existing Description from the 1995 ESD) Once the groundwater barrier wall and the permeable reactive barrier have been installed, the entire south landfill shall be capped. The cap shall include a synthetic geomembrane and a geosynthetic clay liner. South James Street/Basin Road will be left in place, and the cap will be sufficiently tied into the existing road structure so as to eliminate, to the extent practicable, infiltration of precipitation along the roadway.

PERFORMANCE STANDARDS:

3.3.1. Prior to ~~excavating~~ *disruption of any wetland habitat along South James Street, 32.8* work-hours shall be spent collecting and moving to a new environment any wildlife that is residing in areas to be affected by the remediation.

3.3.2. Replaced by 3.3.8 in the 1995 ESD.

3.3.3. The landfill cap shall be designed and constructed in such a way as to limit to the maximum extent practicable any encroachment on the south wetlands, the south pond, and the Christina River. The wetlands constructed in place of the berm, as described in paragraphs 3.4.1 and 3.4.2, shall be used to replace the loss of any wetlands caused by the construction of the south landfill cap.

3.3.4 Replaced by 3.3.9 the in 1995 ESD.

3.3.5. The landfill cap shall have a drainage layer of adequate thickness and appropriate permeability *and shall be constructed with adequate slopes* to ensure that any surface water infiltration ~~at the south landfill that reaches the geomembrane~~ is effectively ~~distributed~~ conveyed off the cap.

3.3.6. The landfill cap shall be designed and constructed: to function with minimum maintenance; to promote drainage and minimize erosion or abrasion of the cover; to accommodate settling so that the cover's integrity is maintained; and to provide adequate freeze protection for the cap.

3.3.7. The landfill cap shall be re-vegetated *in order to protect the cap* and in such a way as to provide a high quality wildlife habitat to the maximum extent practicable (without endangering the liner), *in accordance with the habitat balance sheet (see Performance Standard 8.7.1 in the 1993 ROD)*. The types of vegetation shall be identified in the remedial design and are subject to EPA approval.

3.3.8. A landfill cap shall be installed that completely covers (to the maximum extent practicable) the south landfill including the portion owned by DuPont and the portion owned by the State of Delaware, *except for the part of the landfill that is covered by South James Street/ Basin Road (see Performance Standard 3.3.12 below)*. The cap, at a minimum, shall extend to the vertical barrier wall/*permeable reactive barrier system* and shall be constructed in such a way as to prevent infiltration of water between the edges of the cap and the vertical barrier wall or PRB. ~~Should~~ *Since* the vertical barrier wall *will* not contain all of the waste material along the riverbank, the cap shall extend beyond the waste material to ~~such an extent as the mean low tide elevation (approximately -1.6 feet)~~ to prevent rainfall from infiltrating the waste material *and to minimize the transport of contamination from the landfill to the river due to the influence of the tidal fluctuations in the river*.

3.3.9. The permeability of the landfill cap shall be a maximum of 1×10^{-7} centimeters/second (cm/s) and shall contain a geomembrane layer *and a geosynthetic clay liner underneath the geomembrane*.

3.3.10. Deleted.

3.3.11. The capping activities (and potentially other remedial action tasks at the south landfill and south wetlands) will require temporary restrictions ~~or re-routing~~ of traffic along South James Street/Basin Road. Nearby residents and businesses shall be notified in a timely manner of these activities. The scheduling *and flow* of work shall be done in such a way as to allow ~~limited road access~~ through this area during normal daily business hours ~~for vehicles which do not have an alternate route~~.

3.3.12. (Replaces 3.3.10) South James Street/Basin Road shall be left in place and shall serve as the cap for the portion of the landfill that it covers. The anchor trenches for the geomembrane in this area shall be underneath the asphalt shoulders of the road. The shoulders shall be repaved in accordance with Delaware Department of Transportation requirements.

3.3.13. An operations and maintenance plan for South James Street/Basin Road shall be prepared to ensure infiltration is minimized. The plan will provide for an annual inspection and repair of potholes and cracks. In addition, the annual inspection will include an assessment of roadway integrity and specifically address the need for more extensive repairs, such as resurfacing.

3.3.14. The portion of the cap in the intertidal riverbank area will include armor stone to prevent the river from eroding the landfill.

3.4. Site Security and Berm Removal

DESCRIPTION: The berm shall be removed to the maximum extent practicable without adversely affecting the south pond. Also, in order to provide better Site security to control trespassing, additional fencing and a barrier of thorny plants shall be installed around the entire south landfill area including the landfill and the adjacent wetland area.

PERFORMANCE STANDARDS:

3.4.1. The berm shall be removed to the maximum extent practicable without adversely affecting the south pond. As much area as possible shall be graded to allow wetland hydrology to develop. The south wetland restoration program, outlined in paragraphs 4.1.10 and 4.1.11 of the 1993 ROD, shall be performed in this area as well.

3.4.2. Human access to the Site shall be limited ~~to the maximum extent practicable to such activities that do no interfere, or pose a risk of interfering, with the integrity of the cap or other components of the south landfill remedy,~~ without severely limiting the migration of terrestrial animals into this area. This shall be accomplished by using a combination of fencing and thorny plants. The locations of the fences and the thorny plants (see Figure 28 of the ROD for the approximate location of the fences and bushes) and the choice of plants is subject to EPA approval.

3.5. South Landfill Institutional Controls

DESCRIPTION: Institutional controls shall be placed on the DuPont property south of the Christina River and on the State of Delaware's contaminated property to restrict future land use, to notify the public of past land use, and/or to ensure the protectiveness of the remedy. ~~A health and safety plan shall be developed to protect future maintenance workers who may be required to come in contact with landfill waste (such as sewer main workers).~~

PERFORMANCE STANDARDS:

3.5.1. No excavation or construction, ~~except as necessary to maintain that could affect the integrity and~~ or the level of protectiveness of the south landfill cap, shall occur once the cap is installed.

3.5.2. The south landfill shall not be used for residential purposes.

3.5.3. Once remediation at the south landfill is completed and the vegetation is restored (*in accordance with Performance Standard 3.3.7 above*), the vegetation shall not be removed except ~~for~~ during maintenance activities *of the landfill, utilities or roadway*.

3.5.4. No drinking water wells shall be installed at the south landfill. No industrial water production wells shall be installed in the Potomac aquifer at the south landfill.

3.5.5. The restrictions on the use of the property shall be included in the deeds to the Site property. The deeds to the affected property shall also be modified to give notice to the public of past land disposal and of the fact that releases and threats of releases of hazardous substances have affected their respective parcels.

3.5.6. Additional measures may be required to implement the institutional controls outlined in paragraphs 3.5.1 to 3.5.5.

3.5. South Landfill Cost

DESCRIPTION: The estimated present worth cost of ~~Alternative #5 is \$14,300,000 of the permeable reactive barrier wall system and cap is \$5,050,000~~. See Table 16B for details of the cost estimate including the capital cost and annual operations and maintenance costs.

3.6. Ground-water Barrier Wall

DESCRIPTION: (Replaces existing description in 1995 ESD) A vertical barrier wall shall be installed from the ground surface to a low-permeable clay layer that lies below the waste material in the south landfill. The wall shall be constructed parallel to the riverbank and be located along the south side of the New Castle County sewer main that runs through the landfill. The slurry wall will join the permeable reactive wall section at each end in order to form a continuous wall.

PERFORMANCE STANDARDS:

3.6.1. A vertical ground water barrier wall designed to limit, to the maximum extent practicable, the migration of ground water from outside the landfill into the landfill (~~or~~ *and vice-versa*) shall be installed. The *maximum* permeability of the wall shall ~~at least be equivalent to~~ *be no more than* the permeability of a 3 foot thick, 1×10^{-7} cm/s barrier.

3.6.2. The wall shall extend from the ground surface to an intermediate clay lens in the Columbia aquifer that is below the waste material. The wall shall extend at least ~~2~~ *three* feet into the clay lens.

3.6.3. Deleted.

3.6.4. Different barrier wall technologies including deep soil mixing, sheet piles, geosynthetic membranes, and slurry walls shall be evaluated in the remedial design. Of the technologies that are implementable, the remedial design shall identify the technology considered to have the longest life. More than one technology may be necessary depending on the wall location. The final decision as to the type of barrier wall technology to be used shall be subject to EPA approval during the remedial design. Near the sewer main and South James Street/Basin Road, the wall must be constructed in such a way as to not interfere with the integrity of the main or the road. ~~If any piping must cross the wall, the wall must form a seal around the pipe to prevent a preferential flow path from forming.~~

3.6.5. Deleted.

3.6.6. (Replaces 3.6.3) The wall shall be placed parallel to the riverbank along the south side of the New Castle County sewer main. The wall shall be installed as close to the force main as possible, but not so close as to risk damage to the force main as a result of the construction. The impermeable barrier wall will be keyed into the permeable reactive barrier wall sections on either end to create a continuous wall around the south landfill wastes.

3.7. **Ground-water Pump & Treat System** -- (Deleted, including Performance Standards 3.7.1 to 3.7.5)

3.8. **Sulfate/Sulfide Treatment** -- (Deleted, all except Performance Standard 3.8.5, including Performance Standards 3.8.1 to 3.8.4 and 3.8.6 to 3.8.10.)

3.8.5. *Ground water migrating through the permeable reactive barrier wall (described below) shall not exit the permeable reactive barrier wall with Treatment shall continue until the contaminant levels in each of the recovery wells is below above the following criteria:*

Barium	7,800	ppb
Cadmium	4	ppb
Copper	18	ppb
Lead	15	ppb
Manganese	1,000	ppb
Nickel	730	ppb
Zinc	120	ppb

3.9. **Permeable Reactive Barrier (PRB) Wall**

DESCRIPTION: A vertical, permeable reactive barrier (PRB) wall, consisting of gypsum, zero-valent iron, magnesite, and sand will be installed to immobilize all constituents of interest (listed in Performance Standard 3.8.5 above) that could migrate from the south landfill. The PRB wall shall be installed from the ground surface to a low-permeable clay layer that lies below the waste material in the south landfill. The wall shall be placed along the remainder of the landfill perimeter not bounded by the vertical ground-water barrier wall. The PRB wall shall

be keyed into the vertical groundwater barrier wall at each end in order to form a continuous barrier circumscribing the south landfill.

PERFORMANCE STANDARDS:

3.9.1. A vertical PRB wall shall be installed that prevents all contaminants listed in Performance Standard 3.8.5 from migrating in ground water from the south landfill at levels above the treatment standards established in Performance Standard 3.8.5.

3.9.2. The PRB wall shall run along the southern perimeter of the landfill, just beyond the waste material, and shall connect with either end of the ground water barrier wall. The portion of the PRB that has to cross South James Street/Basin Road may be replaced with a wall similar to the ground water barrier wall to help reduce impacts to traffic along the road.

3.9.3 The minimum thickness of the wall shall be 18 inches. However, if installation methods, and associated quality control procedures, can not be used with sufficient certainty to construct just an 18-inch thick wall, the design thickness shall be increased to guarantee a minimum 18-inch thick wall throughout the length of the PRB wall.

3.9.4. The PRB shall extend from the ground surface, to the intermediate clay lens in the Columbia aquifer that is below the waste material and is continuous throughout the area of the south landfill. A sufficient number of soil borings shall be performed to adequately define the depth of the clay lens. The PRB wall should extend three feet into the clay lens.

3.9.5. To serve as an early warning of any possible contaminant breakthrough, monitoring wells shall be installed on 200-foot centers (approximately ten in number) in the outer portion of the reactive barrier (the center of the wells shall be approximately 6 inches from the outer edge of the wall). The wells shall be screened across the entire reactive zone.

3.9.6. In order to monitor the overall performance of the PRB wall, monitoring wells shall be installed inside and outside of the PRB wall at locations in-line with approximately on-half of the wells required in Performance Standard 3.9.5. The wells shall be screened across the entire reactive zone.

3.9.7. The monitoring wells called for in Performance Standards 3.9.5 and 3.9.6 shall be sampled for the Target Analyte List (TAL) of metals on a quarterly frequency for one year and on a semi-annual frequency thereafter upon approval by EPA. Field measurements of pH, eH, and dissolved oxygen will also be performed. At the next 5-year review for the Site, the monitoring frequency will be reviewed by EPA and adjusted as appropriate. EPA anticipates that the frequency will be decreased at that time. If the monitoring shows that the permeable reactive barrier wall is not adequately controlling contaminant migration from the landfill, steps shall be taken, subject to EPA approval, to control the migration including, if necessary, reinstallation of the permeable reactive barrier wall.

3.9.8. The PRB wall shall be installed prior to capping the main section of the landfill.

3.10. Other South Landfill Performance Standards

DESCRIPTION: A health and safety plan shall be developed to protect future maintenance workers who may be required to come into contact with landfill waste (such as sewer main workers *or highway workers*). (Originally part of Performance Standard 3.5 in the 1995 ESD.)

PERFORMANCE STANDARDS:

3.10.1. A health and safety plan shall be developed to protect future maintenance workers who may be required to come into contact with landfill waste (such as sewer main workers *or highway workers*).

8.6. ARARs

DESCRIPTION: The selected remedy shall meet all chemical, location, and action specific ARARs that apply to the remedy unless waived formally by EPA.

PERFORMANCE STANDARDS:

8.6.1. Deleted in 1995 ESD

8.6.2. (Replaces 8.6.1) The selected remedy shall attain, at a minimum, all chemical, location, and action specific applicable or relevant and appropriate requirements (ARARs) listed in Table 12A unless waived formally by EPA.

STATUTORY DETERMINATION

The 1993 ROD states:

EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences. These requirements specify that when complete, the selected remedial action for each site must comply with applicable or relevant and appropriate (ARARs) environmental standards established under federal and state environmental laws unless a statutory waiver is invoked. The selected remedy also must be cost effective and utilize treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances.

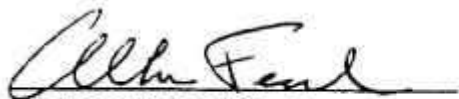
The 1993 ROD goes on to describe how the selected remedy for the DuPont-Newport Site, including the south landfill area, meets each of the five statutory requirements and preferences (see the 1993 ROD, pages 83-91, for the detailed description). The change to the south landfill remedy as described in this ESD continues to provide for the overall protection of human health

and the environment, complies with ARARs, is cost-effective (in fact more cost-effective than either the 1993 or 1995 south landfill remedies), continues to utilize permanent solutions and treatment technologies to the maximum extent practicable, and continues to meet CERCLA's preference for treatment as a principal element through the use of the permeable reactive barrier system. Therefore, EPA has determined that this change to the remedy for the south landfill satisfies CERCLA § 121.

SUMMARY

In summary, EPA is changing the remedy for the south landfill component of the August 16, 1995 ESD and August 26, 1993 ROD. The revised remedy includes a circumscribing barrier/PRB wall system and double barrier cap that will isolate the waste materials from the surrounding environment. The revised remedy changes the waste treatment from sodium sulfide/sulfate injection to the *in-situ* permeable reactive barrier treatment technology using zero-valent iron, gypsum, and magnesite. The net present worth cost of the revised remedy for the south landfill is \$5,050,000.

It is believed that this revised remedy ranks significantly better than the original 1993 ROD and 1995 ESD remedies with respect to the nine criteria used to evaluate remedies. It is also believed that this revised remedy would protect human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The revised remedy will satisfy the preference for treatment as a principal element.


Abraham Ferdas, Director
Hazardous Site Cleanup Division

5/18/01
Date

TABLE 1

EPA CRITERIA FOR EVALUATING ALTERNATIVES

Threshold Criteria

Overall Protection of Human Health and the Environment: Describes how the alternative achieves and maintains protection of human health and the environment, and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs: Addresses whether an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental laws and/or justifies invoking a waiver.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence: Considers the ability of the remedy to maintain reliable protection of human health and the environment over time once clean-up goals have been met.

Reduction of Toxicity, Mobility, or Volume Through Treatment: Describes the anticipated performance of the treatment technologies that may be employed in an alternative.

Short-Term Effectiveness: Examines the effectiveness of an alternative in protecting human health and the environment during the construction and implementation of the remedy, until the clean-up levels are achieved.

Implementability: Evaluates the technical and administrative feasibility of an alternative and the availability of required materials and services.

Cost: Considers the capital, as well as operation and maintenance (O&M) costs of the alternatives.

Modifying Criteria

State Acceptance: Indicates whether the state agency, based on its review of the proposed remedy change, concurs with, opposes, or has no comment regarding the new remedy.

Community Acceptance: A measure of the community's general acceptance of the new remedy.

TABLE 12B (5/2001)
(Changes to Table 12A [8/95 ESD] are in italics or "strikeout")

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
AND TO BE CONSIDERED MATERIAL TBCS)
DU PONT-NEWPORT SITE

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
1. CHEMICAL SPECIFIC					
A. Water					
1. Safe Drinking Water Act	42 U.S.C. § 300f <u>et seq.</u>				
a. Maximum Contaminant Levels Goals (MCLGs)	42 U.S.C. § 141.50-51	Relevant and Appropriate	Non-enforceable health goals for public water supplies. The NCP requires that non-zero MCLGs shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release.	The "greater harm to human health and the environment" ARAR waiver has been invoked for both the Potomac and Columbia aquifers.	GW
b. Maximum Contaminant Levels (MCLs)	40 C.F.R. § 141.11-12	Relevant and Appropriate	Enforceable standards for public drinking water supply systems (with at least fifteen service connections or used by at least 25 persons). The NCP requires that MCLs, for those contaminants whose MCLG is zero, shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLs are relevant and appropriate under the circumstances of the release.	The "greater harm to human health and the environment" ARAR waiver has been invoked for both the Potomac and Columbia aquifers.	GW
c. Maximum Contaminant Levels (MCLs)	40 C.F.R. § 141.11-12	Applicable	Enforceable standards for public drinking water supply systems (with at least fifteen service connections if used by at least 25 persons). MCLs apply to public water systems that provide piped water for human consumption.	Installation of public water supply line shall be done in such a way as to provide drinking water in compliance with these standards.	GW
2. Health Effects Assessment		To be Considered	Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also "to be considered" are Carcinogenic Potency Factors and Reference doses provided in the Superfund Public Health Evaluation Manual	To be considered where remedial action addresses risk-based criteria or when setting clean-up standards for the protection of human health.	NL,SL, CG/HR, GW

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
3. Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites	EPA OSWER Directive #9355.4-02, dated 12/8/89	To Be Considered	To be considered when remedial action addresses soils that cause a threat to human health through direct contact, ingestion, or inhalation of lead.	To be considered when lead is present and remedial action addresses soils that cause a threat to human health through direct contact, ingestion, or inhalation.	BP,NL, SL, CG/HR
4. State of Delaware Regulations Governing Public Drinking Water Revised March, 11, 1991	Sections 22.2, 22.3, 22.4, 22.6, 22.10	Relevant and Appropriate	Sets criteria for public drinking water supplies. These requirements are not directly applicable since ground water at the Site is used as a private drinking water supply. However, under the circumstances of this Site, these requirements are relevant and appropriate.	The “greater harm to human health and the environment” ARAR waiver has been invoked for both invoked for both the Potomac and Columbia aquifer.	GW
6. State of Delaware Regulations Governing Public Drinking Water Revised March 11, 1991	Sections 22.2, 22.3, 22.4, 22.6, 22.10	Applicable	Sets criteria for public drinking water supplies.	Installation of public water supply line shall be done in such a way as to provide drinking water in compliance with these standards.	GW
7. Delaware Comprehensive Water Resources Management Committee Reports, December 13, 1983		To Be Considered	The reports were adopted as policy by the DNREC Secretary. Among these reports is the Groundwater Quality Management Report, July 1983, which provided Delaware with a number of tools for dealing with ground-water contamination.	To be considered for ground-water monitoring.	GW
8. Clean Water Act	Clean Water Act, Section 303	Relevant and Appropriate	Water quality criteria set at levels to protect human health for water and fish ingestion and protection of aquatic life in streams, lakes, and rivers.	These standards have been waived for the surface water in the Christina River by invoking the “technical impracticability” ARAR waiver due to non-Site related upstream sources of contamination.	CR
9. Delaware Surface Water Quality Standards as amended, Feb. 26, 1993	Sections 3, 4, 5, 6, 8, 9, 10, 11.1, 11.2, 11.3, 11.4, 11.6, 12	Applicable	Criteria are provided to maintain surface water for streams, lakes, rivers, and standing water in wetlands of satisfactory quality consistent with public health and recreational purposes, the propagation and protection of fish and aquatic life, and other beneficial uses of water.	1. Any surface water discharge must meet these levels if more stringent than federal regulations. 2. These standards have been waived for the surface water in the north wetlands and the Christina River by invoking the “technical impracticability” ARAR waiver due to non-Site related upstream sources of contamination. These standards have been waived for the surface water in the south wetlands by invoking the “greater harm to human health and the environment” ARAR waiver.	NL, SW, CR, CG/HR SL

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
B. Air					
1. Clean Air Act	42 U.S.C. § 7401				
a. National Emissions Standards for Hazardous Air Pollutants	40 C.F.R. Part 61	Relevant and Appropriate	Standards promulgated for air emissions from specific source categories. Not applicable but may be relevant and appropriate for emission from air strippers at Superfund sites	Relevant and appropriate for potential releases of vinyl chloride and radionuclides resulting from ground-water treatment.	NL, CG/HR SL
2. Delaware Ambient Air Quality Standards	Title 7, Delaware Code, Ch 60, Regulation 3, Section 6003	Applicable	Establishes ambient air quality standards	Applicable for potential releases from air stripping of ground water, excavation work, or other remedial actions.	ALL
C. Miscellaneous					
1. Standards for Protection Against Radiation	10 C.F.R. Part 20	Relevant and Appropriate	These standards are designed to limit radiation hazards caused by Nuclear Regulatory Commission-licensed activities. The general requirement is that every reasonable effort to maintain radiation exposures "as low as is reasonably achievable" be made. This regulation also describes specific radiation dose limits for the protection of workers and members of the public, radioactivity concentration limits for effluents, precautionary procedures, and waste disposal requirements.	Rededication must take place in such a way as to prevent over-exposure of radiation to workers or public. Discharges to air or water must meet specific concentration limits for radionuclides. Waste disposal must also meet any pertinent requirements.	NL, CG/HR
2. Delaware Radiation Control Regulations	Title 16, Delaware Code, 7405	Applicable	Establishes regulations for registration of facilities, licensing of materials, standards of protection, safety requirements, and notification requirements.	May be applicable for work at the north landfill and the ground water pump and treat system at this area.	NL, CG/HR
II. LOCATION SPECIFIC					
1. Coastal Zone Management Act of 1972; Coastal Zone Act Reauthorization Amendments of 1990	16 U.S.C. 1451 <u>et seq</u> 15 C.F.R. Part 930	Applicable	Requires that Federal agencies conducting or supporting activities directly affecting the coastal zone, conduct or support those activities in a manner that is consistent with the approved appropriate State coastal zone management program. (See Delaware's comprehensive Update and Routine Program Implementation, March 1993).	On-site remedial actions are required to be consistent, to the maximum extent practicable, with Delaware's coastal zone management program. EPA must notify Delaware of its determination that the actions are consistent to the maximum extent practicable.	NL, SL, SW, CR, CG/HR

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
2. The Archaeological and Historical Preservation Act of 1974	16 U.S.C. § 469	Applicable	Requirements relating to potential loss or destruction of significant scientific, historical, or archaeological data.	Archeological and historical resources have not been identified to date. However, the installation of the physical barrier wall along the Christina River has the potential for disturbing archeological resources. Further action will be taken to identify resources and, if identified, action will be taken to mitigate any adverse effects on those resources that would result from construction. If resources happen to be identified in other areas (although no specific actions will be taken to find), action will be taken to mitigate any adverse effects on those resources that would result from implementation of the remedial action.	NL, CG/HR
3. Protection of Floodplains	40 C.F.R. Part 6, Appendix A	Applicable	Sets forth EPA policy for carrying out provisions of Executive Order 11988 (Floodplain Management) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	Applicable since much of the remedial action will take place within the 500-year floodplain. Due to the volume increase of the south landfill, the berm in the south wetlands will be removed to mitigate the loss of volume inside a floodplain.	ALL
4. Protection of Wetlands	40 C.F.R. Part 6, Appendix A	Applicable	Sets forth EPA policy for carrying out provisions of Executive Order 11990 (Protection of Wetlands) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values	Applicable since the construction of the north and south landfill caps will affect wetlands.	NL, SL, SW
5. Delaware Coastal Zone Act, 7 Delaware Code Chapter 70; Coastal Zone Act Regulations, 6/9/93	7 Delaware Code Sections 7003, 7004	To Be Considered	Controls the location, extent, and type of industrial development in Delaware's coastal areas.	Will be considered for consistency since the remedial action involves substantial aquatic habitat and is located in Delaware's coastal area although not in the defined coastal zone of this statute.	ALL
6. Delaware Wetlands Regulations Revised June 29, 1984	Sections 1, 2, 7	Applicable	Requires activities that may adversely affect wetlands in Delaware to be permitted. Permits must be approved by the county or municipality having jurisdiction	Any substantive requirements shall be met since wetlands will be destroyed and replaced in the north drainage way, and dredged (or excavated) and restored in the north and south wetlands. Since all of the wetland or remediation is considered "on-site", no permit will be obtained.	NL, SL, SW
7. Delaware Regulations Governing the Use of Subaqueous Lands, Amended September 2, 1992	Sections 1, 3, 4	Applicable	Requires activities that affect public or private subaqueous lands in the State be permitted	Any substantive requirements shall be met since the remediation involves dredging of the Christina River. However, no permit shall be obtained.	NL, SL, SW, CR

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
8. Delaware Executive Order 56 on Freshwater Wetlands (1988)		To Be Considered	General policy to minimize the adverse effects to freshwater wetlands.	To Be considered for wetland remediation and restoration.	NL,SL, SW
9. Governor's Roundtable Report on Freshwater Wetlands (1989)		To Be Considered	General policy to minimize the adverse effects to freshwater wetlands.	To be considered for wetland remediation and restoration.	NL,SL, SW
10. Groundwater Protection Strategy of 1984	EPA 440/6-84-002	To Be Considered	Identifies ground water quality to be achieved during remedial actions based on aquifer characteristics and use.	The EPA Aquifer classification will be taken into consideration during design and implementation of the treatment remedy.	GW
III. ACTION SPECIFIC					
A. Miscellaneous					
1. Council on Environmental Quality	40 C.F.R. 1500.2(f)	Relevant and Appropriate	Requires use of all practicable means, consistent with the requirements of NEPA to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects upon the quality of the human environment	Institutional controls shall be added to the north and south landfill properties to make sure they remain wildlife habitat.	NL,SL
2. Delaware Regulations Governing Hazardous substance Cleanup, 1/93	Section 9	Relevant and Appropriate	Establishes clean-up criteria for hazardous waste sites. Only criteria considered relevant and appropriate are for ground water and soil (1×10^{-5} , Hazard index of 1, or natural background if higher).	1. Waived for ground water using the "greater harm to human health and the environment" waiver. 2. Applies to the determination of soil clean up criteria at the Basin Road portion of the south landfill. (Deleted with ESD in August 1995. 2. May apply in determining location of ground water barrier wall at South Landfill.	SL,GW
B. Water					
1. Clean Water Act (CWA), National Pollutant Discharge Eliminating System Requirements	40 C.F.R. Part 122-125	Applicable	Enforceable standards for all discharges to water of the United States.	Discharge limits shall be met for all on-site discharges to surface water including treated ground water and wastewater from dewatering dredge material. Only substantive requirements shall be met and no permit shall be obtained.	NL, CG/HR, CR SL
2. General Pretreatment Regulations	40 C.F.R. Part 403	Applicable	Standards of discharge to POTW.	Applicable should the extracted ground water, treated ground water, or wastewater from dredge material be discharged to a POTW.	NL, SL , CG/HR, CR
3. Section 10 of the River and Harbors Act	33 U.S.C. Section 403 33 C.F.R. Part 320-330	Applicable	Permitting requirements for dredging.	The river dredging will comply to any substantive requirements, but no permit will be obtained.	CR

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
4. State of Delaware Regulations Governing the Construction of Water Wells, January 20, 1987	Sections 3, 4, 5, 6, 7, 8, 9, 10	Applicable	Contain requirements governing the location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment.	Install of any monitoring and recovery wells and the abandonment of wells shall meet all substantive requirements.	NL,SL, SW, CG/HR, GW
5. Delaware Water Quality Standards, as amended, February 26, 1993	Sections 3-6, 8-10, 11.1, 11.2, 11.3, 11.4, 11.6, 12	Applicable	Standards are established in order to regulate the discharge into state waters in order to maintain the integrity of the water	Applicable should the ground-water treatment system involve discharge to surface water.	NL, CG/HR SL
6. Delaware River Basin Commission (DRBC) Water Quality	DRBC Ground Water Protected Area Regulation, No. 4, 6(f), 9, 10; Water Code of the Basin, Sections 2.20.4, 2.50.2	Applicable	Regulate restoration, enhancement, and preservation of waters in the Delaware River basin.	Applicable if remedial action involves discharge of >50,000 gallons/day average over any month or a withdrawal of ground water of 100,000 gallons/day or more average over any month.	NL, CG/HR, SL
7. Delaware Regulations Governing the Allocation of Water March 1, 1987	Sections 1, 3, 5.05	Applicable	Contain information pertaining to water allocation permits and criteria for their approval.	May be applicable for the ground-water recovery system or the public water supply line. No permit required.	NL, SL CG/HR, GW
8. State of Delaware Groundwater Management Plan November 1, 1987		To Be Considered	Policy for ground-water management.	To be considered in setting the ground water management zone.	GW
9. Delaware Regulations Governing Control of Water Pollution, Amended 6/23/83	Section 7, 8, 9, 10, 11, 12, 13	Applicable	Contain water quality regulations for the discharging into surface and ground water.	Applicable for potential discharge of treated ground water into surface water. Also applicable for stormwater runoff into the Christina River.	NL, SL CG/HR
10. State of Delaware Regulations Governing Public Drinking Water March 31, 1991	Sections 22.2, 22.3, 22.4, 22.6, 22.10	Applicable	Establishes requirements for public drinking water supplies.	Applicable for the establishment of public drinking water service to residents along Old Airport Road.	GW

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
C. Air					
1. Control of Air Emissions from Air Strippers at Superfund Ground Water Sites, June 15, 1989	EPA OSWER Directive 9355.0-28	To be considered	Policy to guide the selection of controls for air strippers at groundwater sites according to the air quality status of the site's location (i.e., ozone attainment or non-attainment area).	To be considered in determining if air emissions controls are necessary for an air stripper because New Castle is in an ozone non-attainment area. Sources most in need of control are those with emissions rates in excess of 3 lbs./hour or 15 lbs./day or a potential rate of 10 tons/year of total VOCs.	NL, CG/HR SL
2. Delaware Regulations Governing the Control of Air Pollution	Regulations Number 2, 19, 24	Applicable	Sets forth the requirement that a permit is necessary to operate an air stripper if emissions will exceed 2.5 lbs./day. Section 2 describes general conditions. Section 19 deals with odor. Section 24 deals with volatile organic compounds.	If emissions exceed 2.5 lbs./day then the substantive requirements of the regulation must be met. In addition, the emissions from the air stripper must meet the Ambient Air Quality Standards set forth in Regulation 3 of 7 Delaware Code, Chapter 60, Section 6003.	NL, CG/HR SL
E. Sediments/Solids					
1. Delaware Sediment and Stormwater Regulations January 23, 1991	Section 3, 6, 9, 10, 11, 15	Applicable	Establishes a statewide sediment and stormwater management program.	A stormwater and sediment management plan consistent with Delaware requirements must be approved by EPA only before construction disturbing over 5,000 square feet of land can begin.	NL,SL, SW,CR CG,R
F. Water Handling and Disposal					
1. RCRA Subtitle D Landfill Regulations	40 C.F.R. 258.60(a)	Relevant and Appropriate	Closure requirements for RCRA subtitle D landfill. (Deleted as part of ESD in August 1995).	Provides some technical requirements for the cap at the south landfill.	SL
2. Delaware Regulations Governing Solid Waste	Sections 2, 5f, 5k, 6f, 6k	Relevant and Appropriate	Establishes regulations to implement an improved solid waste management program, specifically relating to erosion control, water management, and post closure care.	Relevant and appropriate for the south landfill.	SL
3. Delaware Regulations Governing Hazardous Waste	SEE BELOW F.5, F.7, F.9, F.11, F.13, F.15, F.17	SEE BELOW	Delaware Regulations Governing Hazardous Waste Part 261 define "hazardous waste". The regulations listed below apply to the handling of such hazardous waste.	SEE BELOW	SEE BELOW

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
4. Resource Conservation and Recovery Acts of 1976; Hazardous and Solid Waste Amendments of 1984	SEE BELOW F.6, F.8, F.10, F.12, F.14, F.16, F.18 Federal regulations would not apply for those regulations which Delaware has the authority from EPA to administer	SEE BELOW	Regulates the management of hazardous waste, to ensure the safe disposal of wastes, and to provide for resource recovery from the environment by controlling hazard wastes "from cradle to grave."	SEE BELOW	SEE BELOW
5. Standards Applicable to Generators of Hazardous Waste	Delaware Regulations Governing Hazardous Waste, Part 262.10-58	Applicable	Establishes standards for generators of hazardous wastes including waste determination manifests and pre-transport requirements.	Applicable to operator(s) of the wastewater treatment plant if the wastes generated by the groundwater treatment system is a RCRA-hazardous waste.	NL, CG/HR SL
6. Standards Applicable to Generators of Hazardous Waste	EPA Regulations, 40 C.F.R. Part 262.10-58	Applicable	Establishes for standards generators of hazardous wastes including waste determination manifests and pre-transport requirements.	Applicable to operator(s) of the wastewater treatment plant if the wastes generated by the ground-water treatment system is a RCRA-hazardous waste.	NL, CG/HR SL
7. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	Delaware Regulations Governing Hazardous Waste, Part 26-4 (40 C.F.R. Part 264)	Applicable	Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes.	Applies to onsite recovery and treatment systems which handle hazardous waste.	NL, CG/HR SL
8. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	EPA Regulations, 40 C.F.R. Part 264	Applicable	Regulations for owners and operators of TSDFs which define acceptable management of hazardous wastes	Applies to onsite recovery and treatment systems which handle hazardous waste.	NL, CG/HR SL
9. RCRA Requirements for Use and Management of Containers	Delaware Regulations Governing Hazardous Waste, Part 264.170-178	Applicable	Requirements for storage of hazardous waste in storage containers.	Applicable for temporary storage containers and on-site treatment systems.	NL,SL, SW, CG/HR, CR
10. RCRA Requirements for Use and Management of Containers	EPA Regulations, 40 C.F.R. Part 264.170-178	Applicable	Requirements for storage of hazardous waste in storage containers	Applicable for temporary storage containers and on-site treatment systems.	NL,SL, SW, CG/HR, CR

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy	Area of Concern
11. RCRA Requirements for Tanks Systems	Delaware Regulations Governing Hazardous Waste, Part 264.190-199	Applicable	Requirements for storage or treatment of hazardous waste in tank systems.	Only applicable for onsite treatment systems and temporary storage tanks containing hazardous wastes.	NL,SL, SW, CG/HR CR
12. RCRA Requirements for Tanks Systems	EPA Regulations, 40 C.F.R. Part 264.190-199	Applicable	Requirements for storage or treatment of hazardous waste in tank systems.	Only applicable for onsite treatment systems and temporary storage tanks containing hazardous wastes.	NL,SL, SW, CG/HR CR
13. The Hazardous Waste Permit Program	Delaware Regulations Governing Hazardous Waste, Part 122	Applicable	Requires a permit for the treatment, storage, or disposal of any hazardous waste as identified or listed in Part 261.	Any substantive requirements will be met. But no permit will be obtained.	NL,SL, SW, CG/HR CR
14. The Hazardous Waste Permit Program	EPA Regulations, 40 C.F.R. Part 122	Applicable	Requires a permit for the treatment, storage, or disposal of any hazardous waste as identified or listed in Part 261.	Any substantive requirements will be met. But no permit will be obtained.	NL,SL, SW, CG/HR CR
15. Identification and Listing of Hazardous Wastes	Delaware Regulations Governing Hazardous Wastes, Part 261	Applicable	Identifies solid wastes which are regulated as hazardous wastes	Use to determine which materials to be disposed of are hazardous wastes.	ALL
16. Identification and Listing of Hazardous Wastes	EPA Regulations, 40 C.F.R. Part 261	Applicable	Identifies solid wastes which are regulated as hazardous wastes.	Use to determine which materials to be disposed of are hazardous wastes.	ALL
17. RCRA Land Disposal Restrictions	Delaware Regulations Governing Hazardous Wastes, Part, 268.	Applicable	Restrictions on land disposal of hazardous wastes	Applies to remedial actions in the south landfill, the south wetlands, and the Christina River only if any treatment is done ex-situ and waste is hazardous. Applies to dirt from the ballpark if it is hazardous.	BP, NL, SL,SW, CR
18. RCRA Land Disposal Restrictions	EPA Regulations, 40 C.F.R. Part 268	Applicable	Restrictions on land disposal of hazardous wastes	Applies to remedial actions in the south landfill, the south wetlands, and the Christina River only if any treatment is done ex-situ and waste is hazardous. Applies to dirt from the ballpark if it is hazardous.	BP, NL, SL,SW, CR

TABLE 16B

REMEDIAL COSTS FOR THE SOUTH LANDFILL

Direct Costs

Cap/Pavement/Riverbank	\$ 1,968,000
Site Preparation	\$ 248,000
Treatment	\$ 977,000
Slurry Wall	\$ 152,000
Total Direct Costs	\$ 3,345,000

Indirect Costs

General Condition, Profit, Overhead, Engineering, Support	\$ 1,076,000
--	--------------

O&M (30yrs, 5%)

(Monitoring, Maintenance)	\$ 385,000
Total Cost	\$ 4,806,000

Contingency (5%)	\$ 240,000
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Total Present Worth Costs	\$ 5,046,000
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FIGURE 1
Site Location Map
E.I. DuPont, Newport Superfund Site

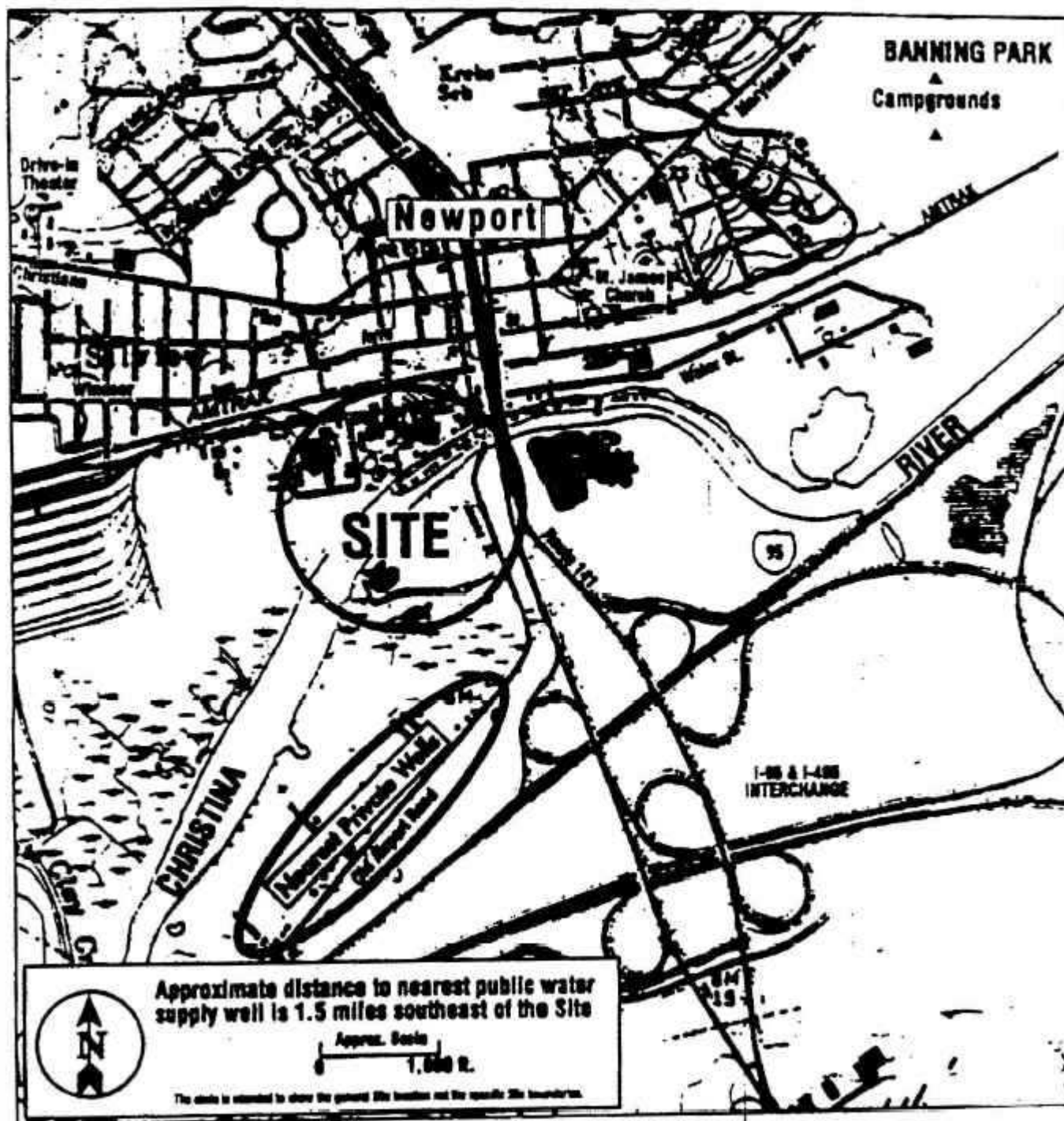


FIGURE 2
Site Layout Map

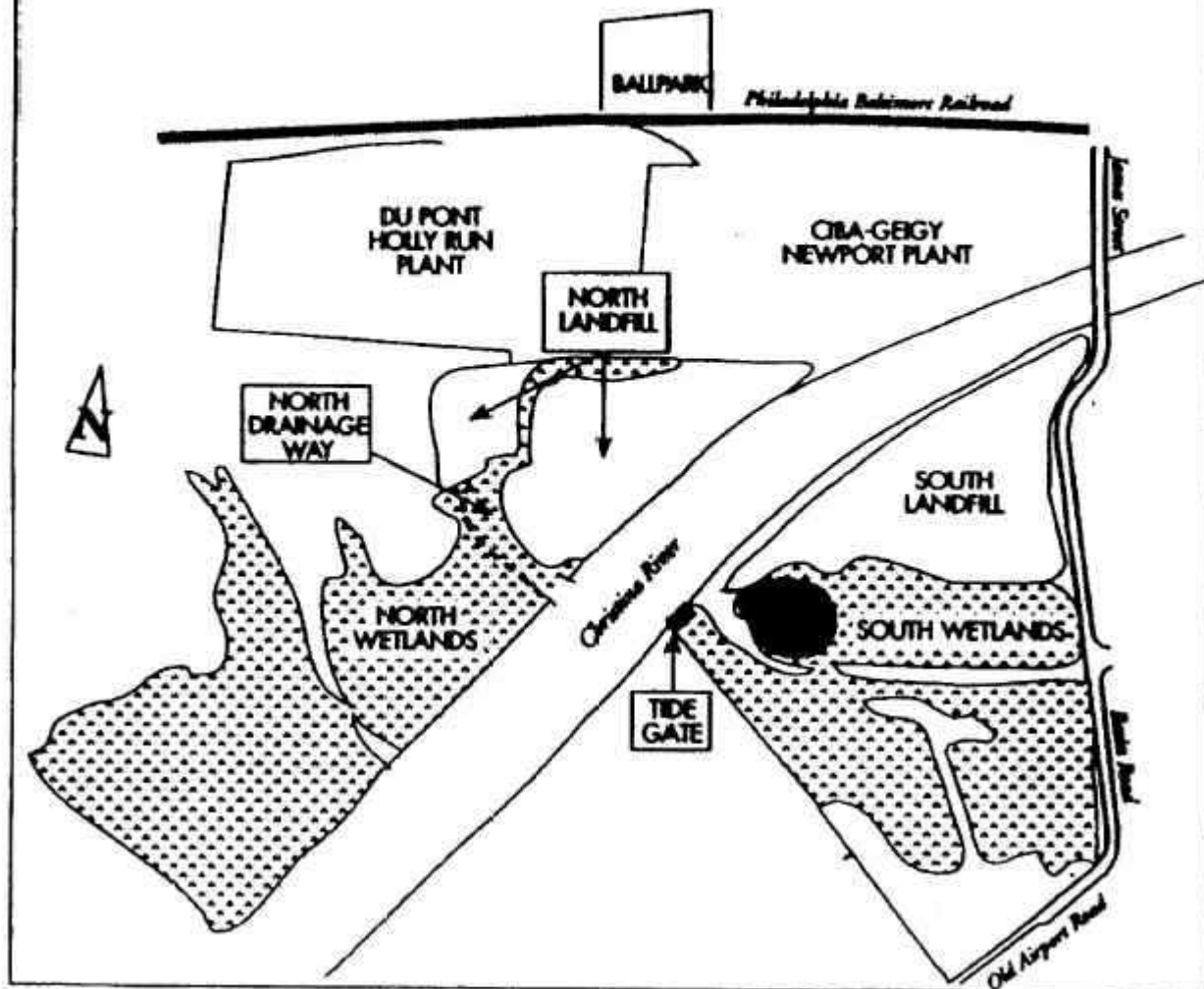
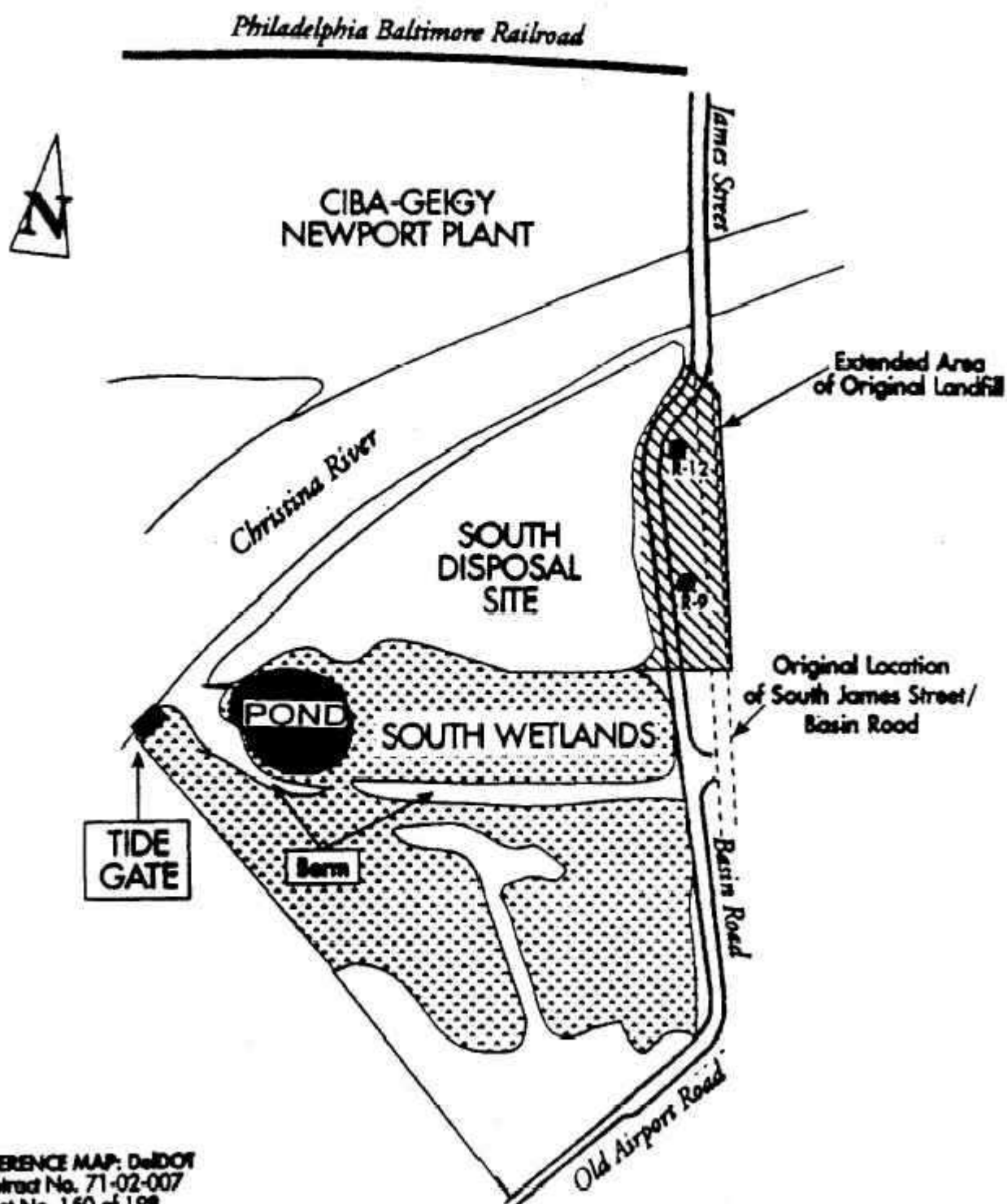


FIGURE 4
Relocated South James Street/Basin Road
Through Newport



REFERENCE MAP: DelDOT
Contract No. 71-02-007
Sheet No. 150 of 198
Page 5000.471 of The Administrative Record.
NOTE: Boring locations are approximate.

FIGURE 5
Configuration of Borings R-9 and R-12

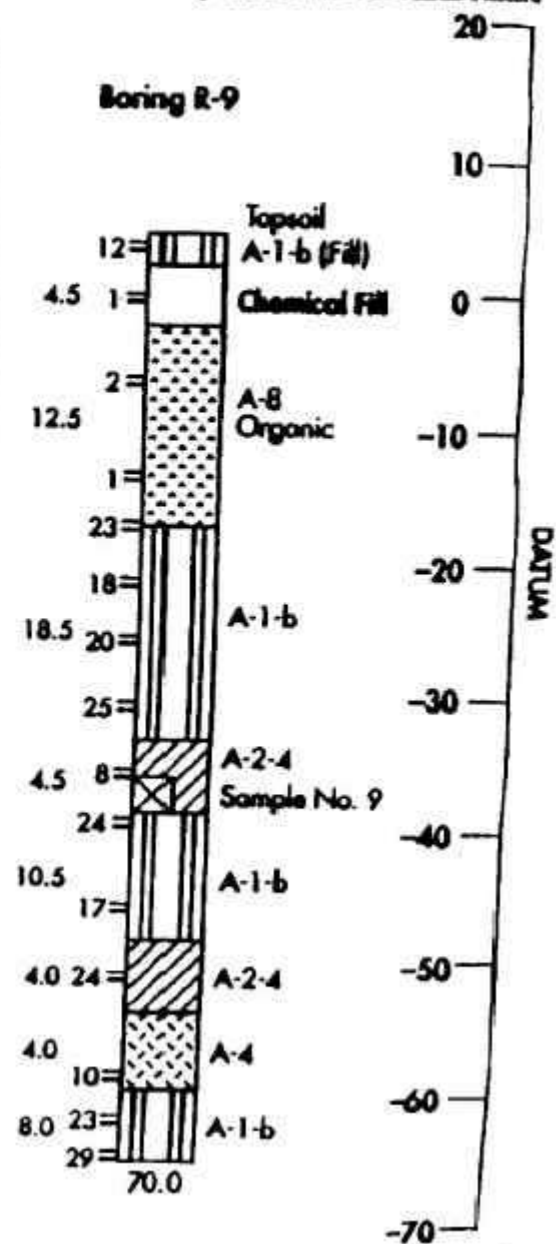
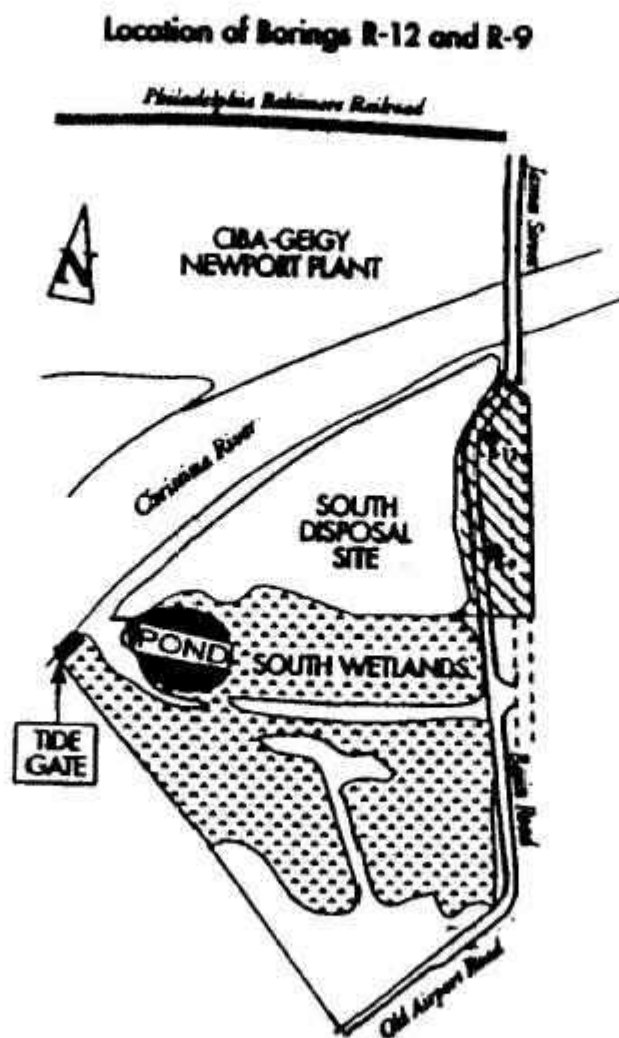
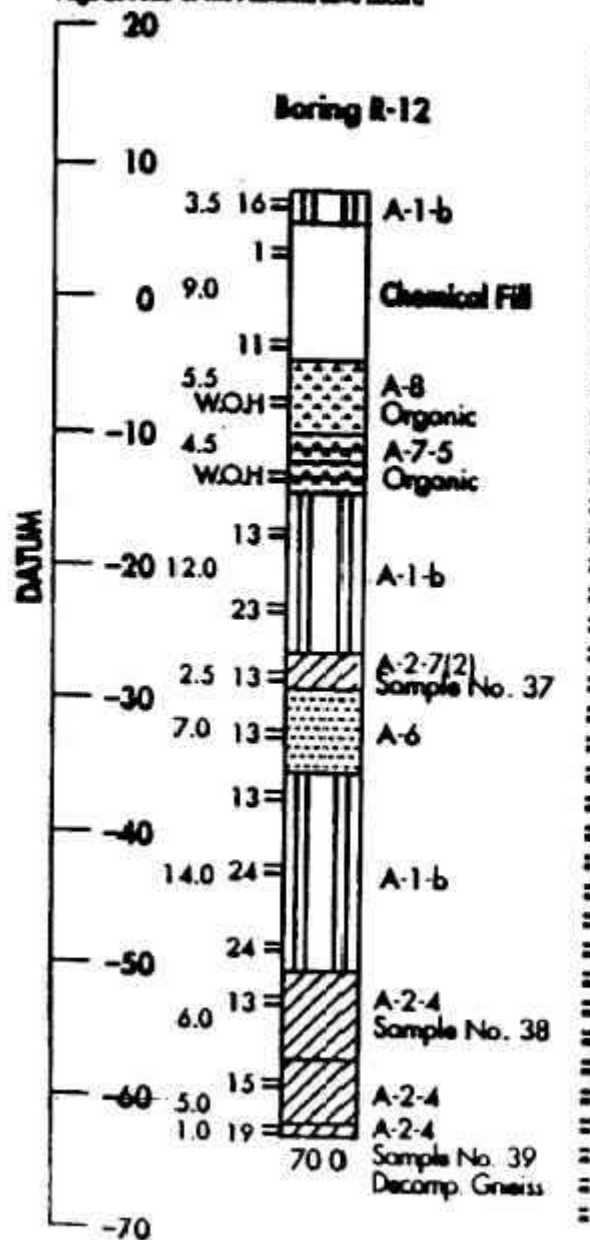


FIGURE 6

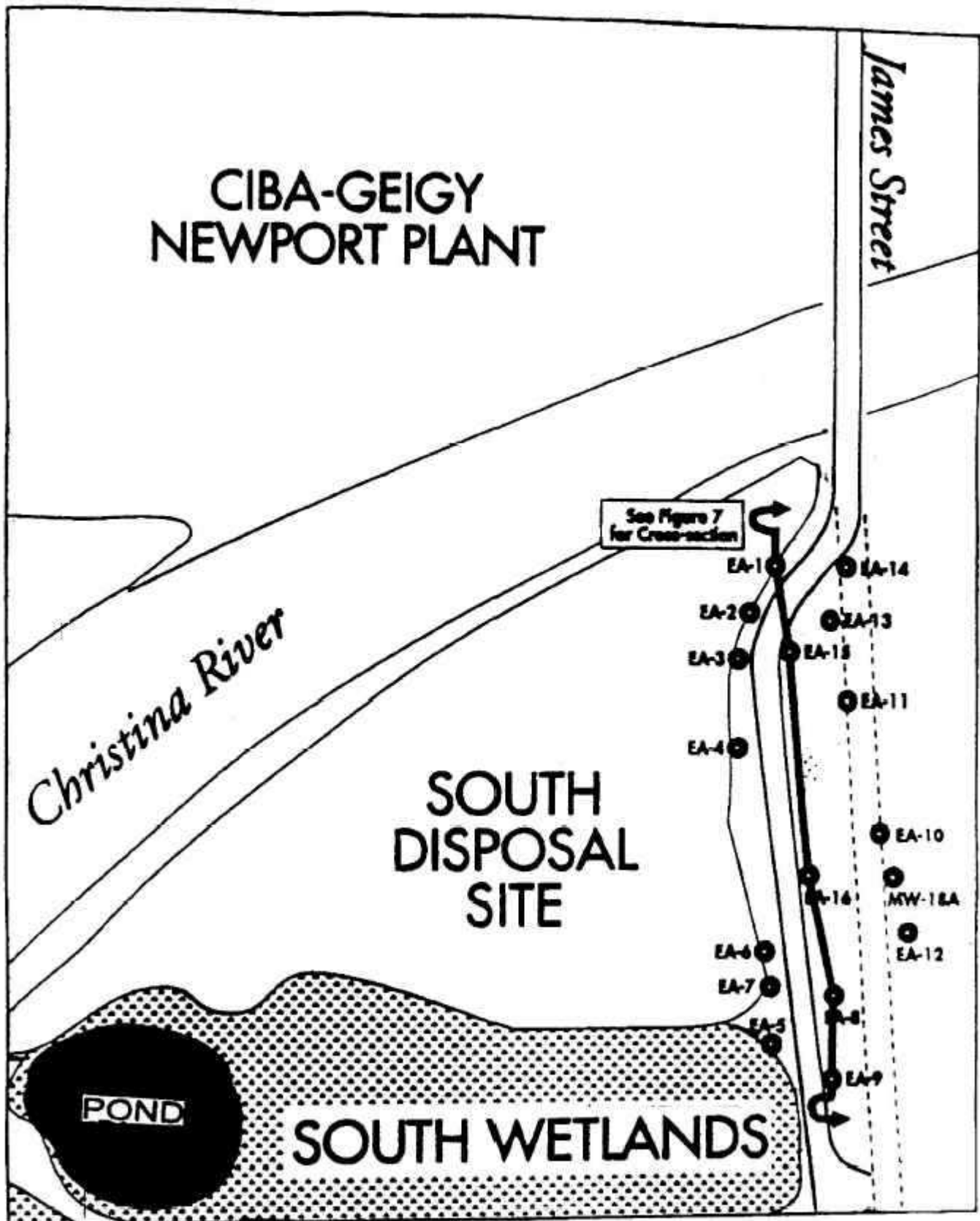
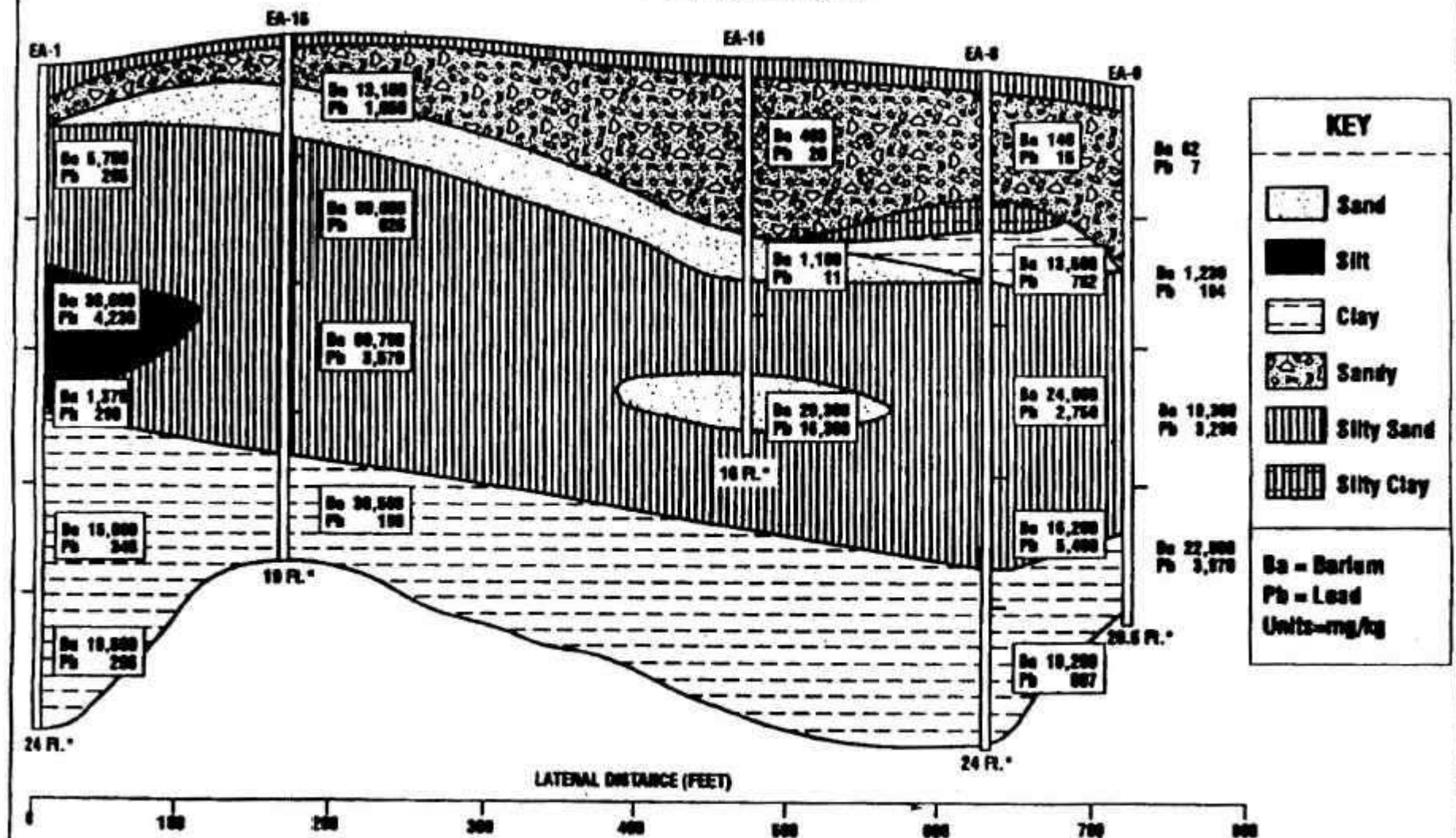


FIGURE 7
Cross-Section



*Zero foot mark for boring depth is top of Boring EA-12 (highest ground surface elevation).
Approximate scale for boring depth: 1 inch = 5 feet.

AR325115

FIGURE 8
South Landfill Cap and Excavation Area

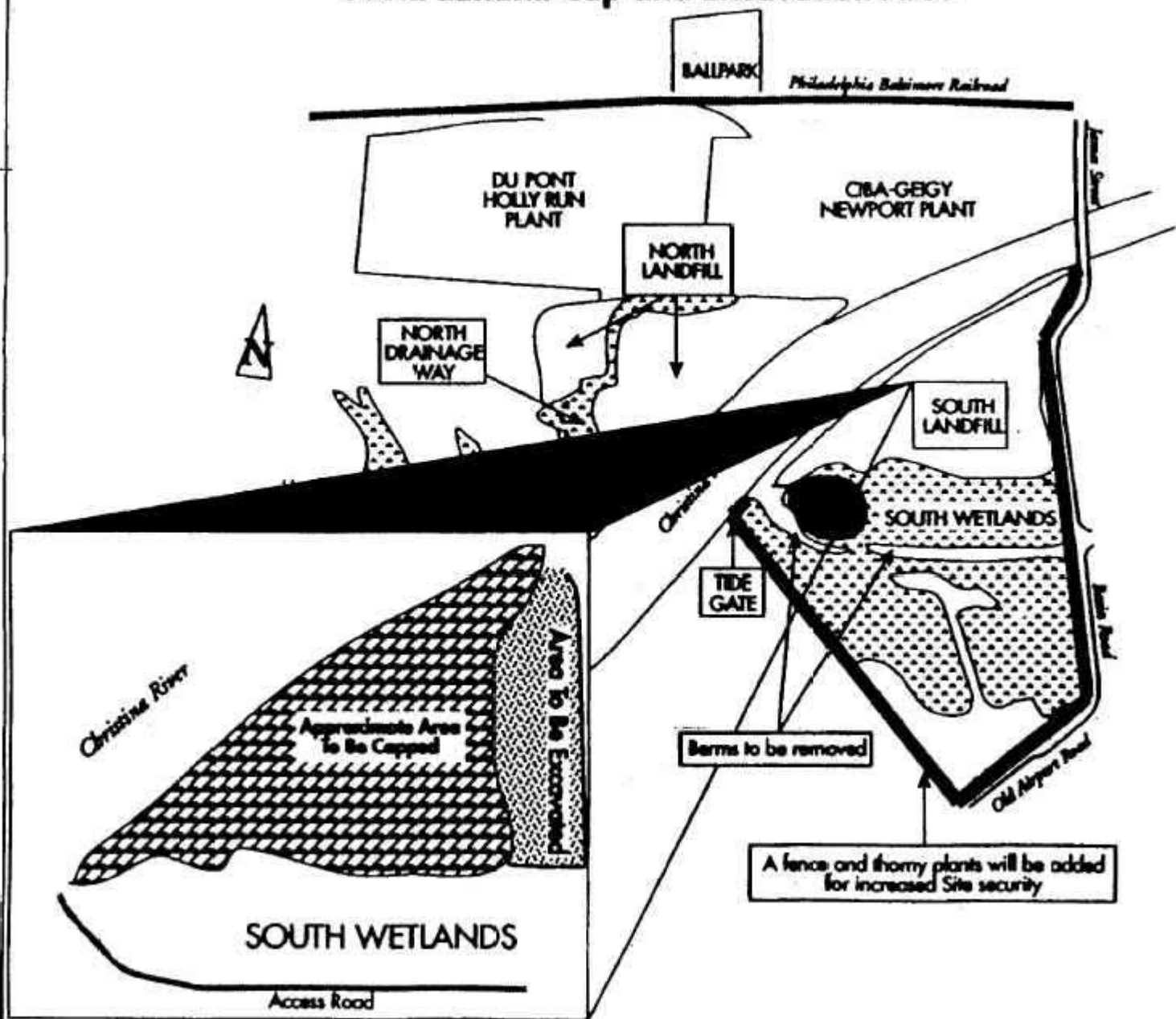
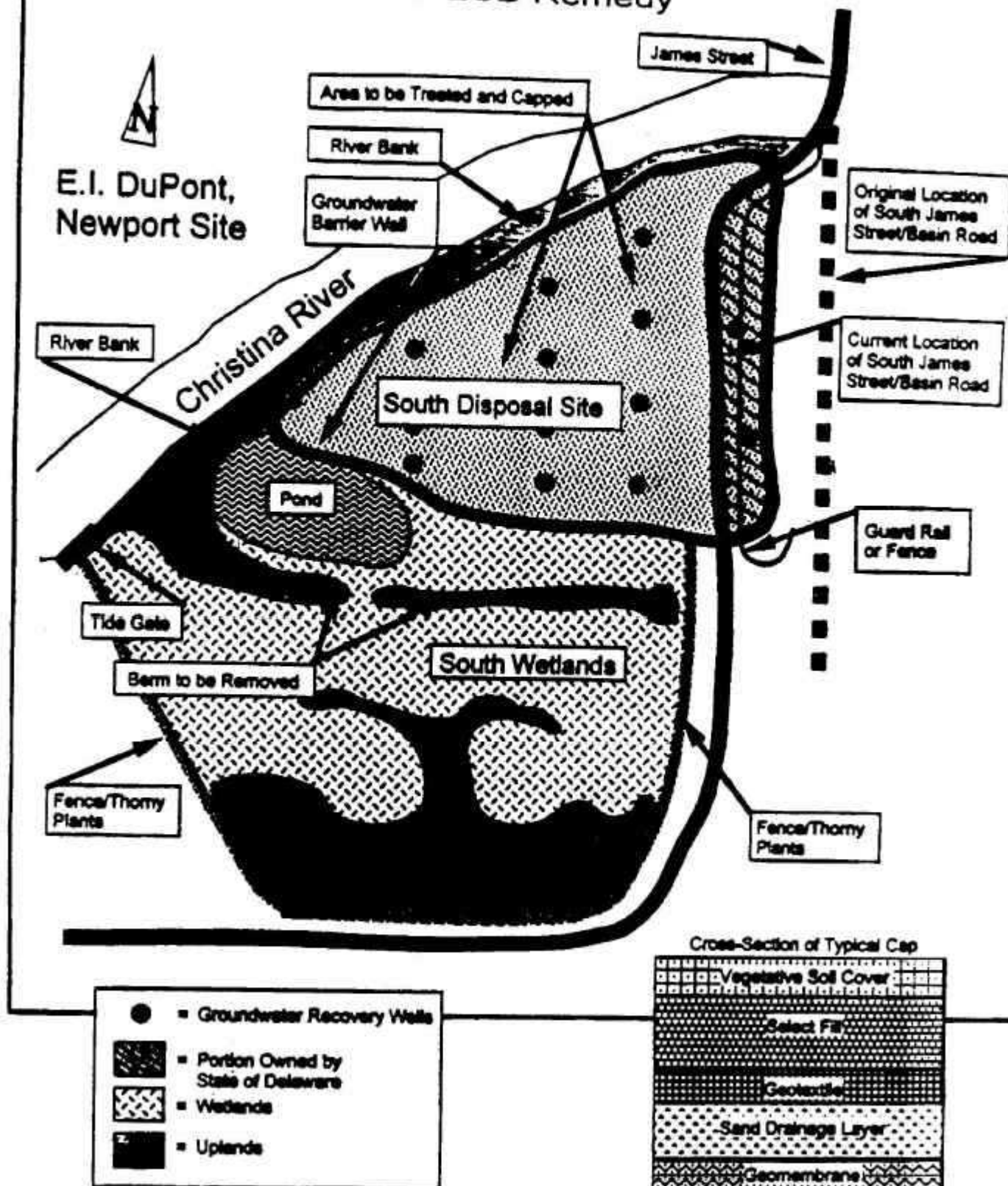
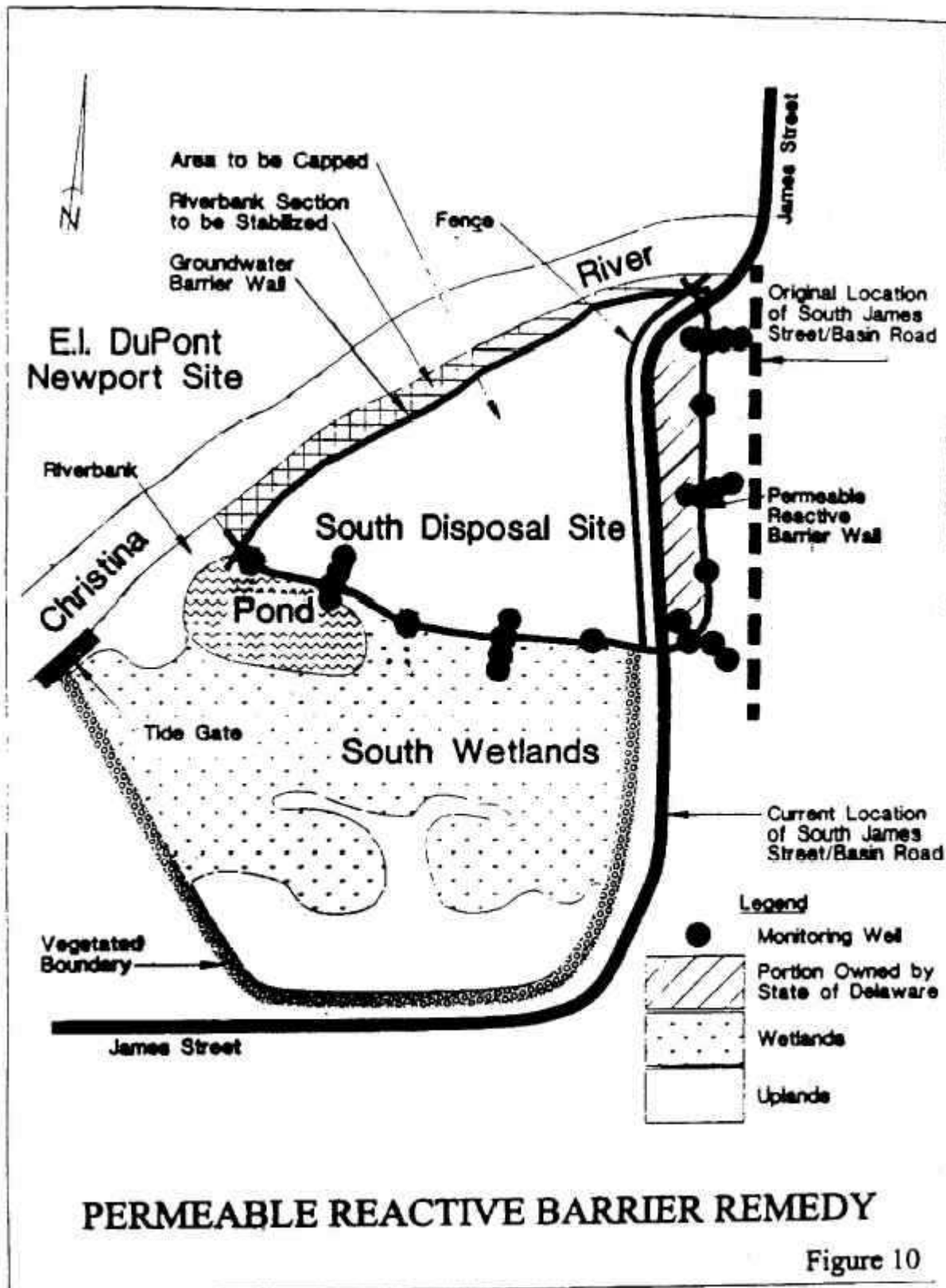


Figure 9
1995 ESD Remedy





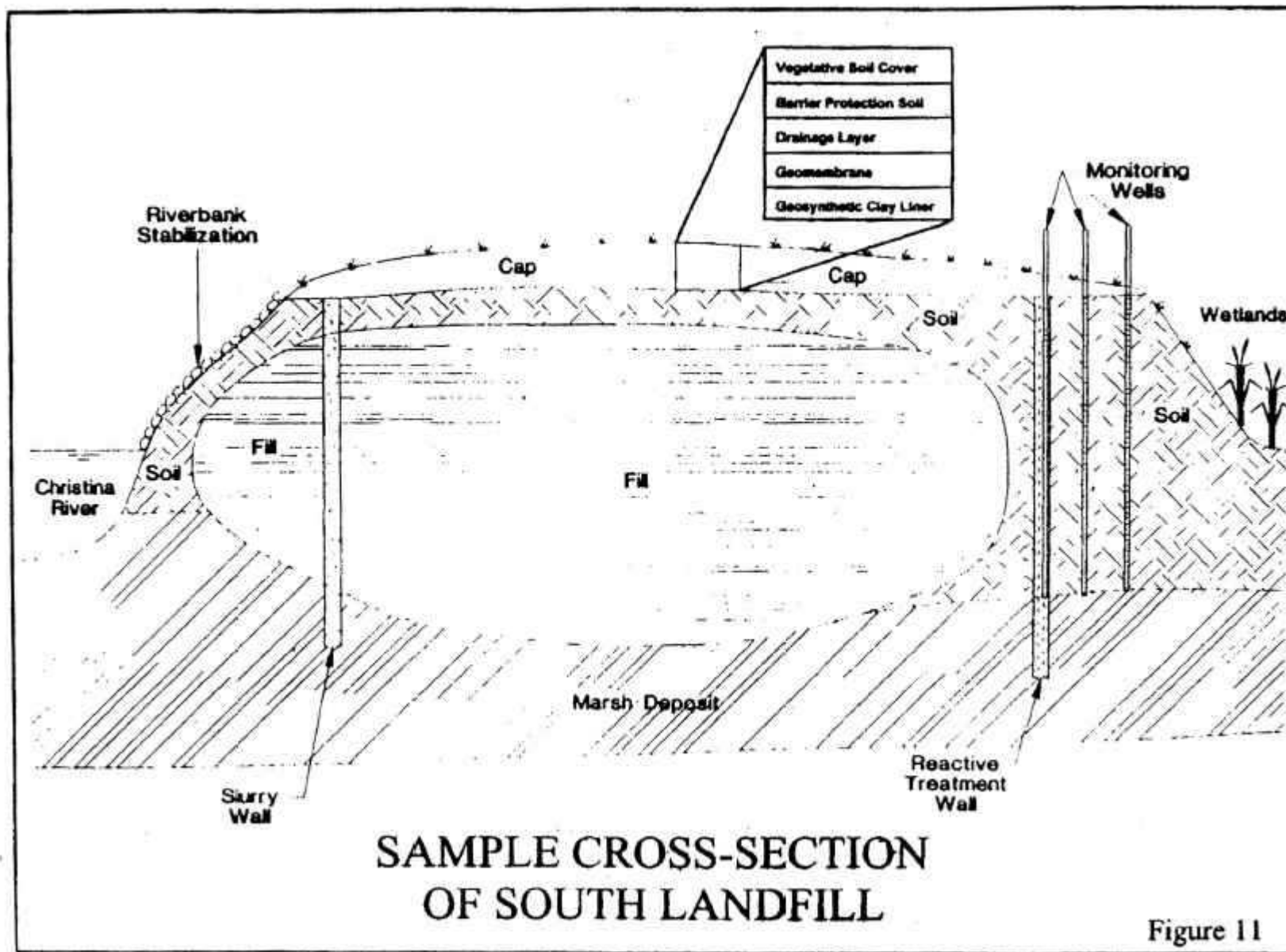
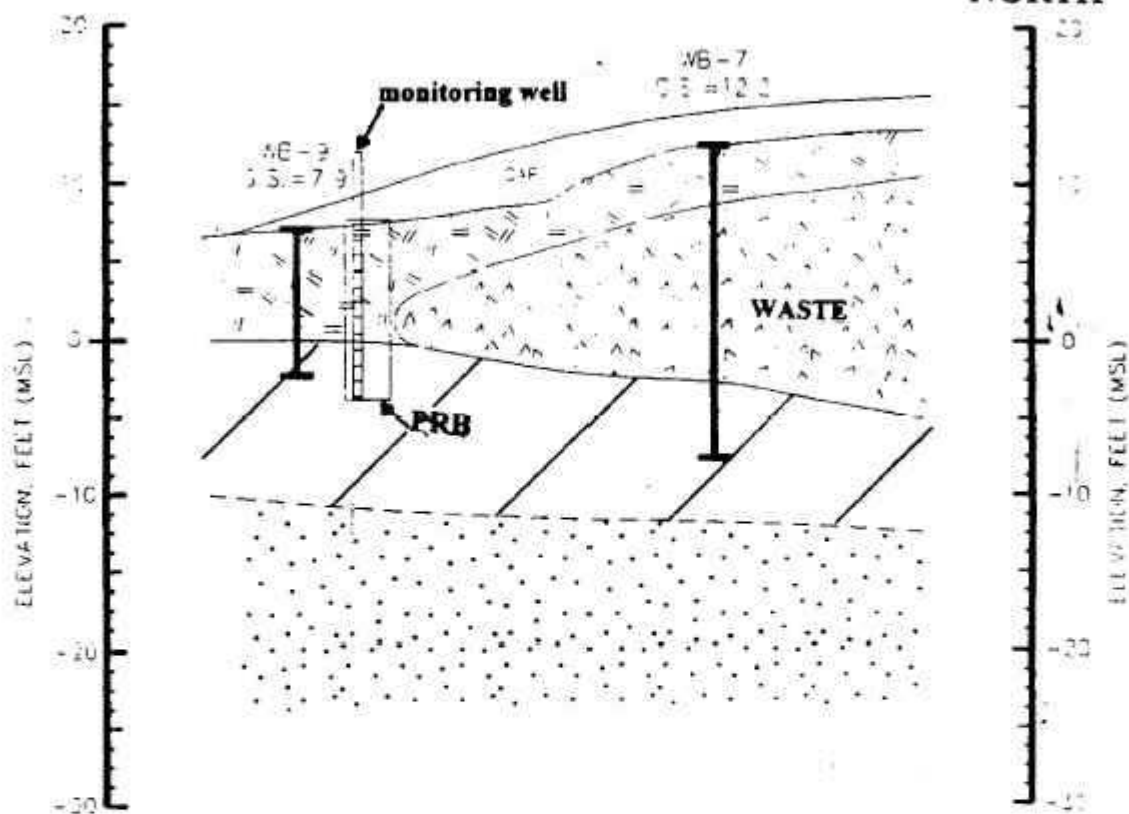







Figure 11

SOUTH

NORTH



LEGEND:

- | | | | |
|---|--|---|---|
|  | COVER SOIL, TYPICALLY GRAY TO BROWN, SILT TO SILTY CLAY |  | SAND, COLUMBIA FORMATION, TYPICALLY GRAY TO ORANGE BROWN FINE TO COARSE SAND, SOME GRAVEL |
|  | FILL MATERIAL |  | CLAY, POTOMAC FORMATION, FIRST CONFINING UNIT RED-GRAY MOTTLED CLAY |
|  | CLAYEY SILT, MARSH DEPOSIT, TYPICALLY DARK TO OLIVE GREEN, CLAYEY SILT | | |

Detail of PRB Wall

Figure 12



STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL
DIVISION OF AIR AND WASTE MANAGEMENT
301 LUKENE DRIVE
NEW CASTLE, DELAWARE 19720-2774

WASTE MANAGEMENT SECTION
SITE INVESTIGATION &
RESTORATION BRANCH

TELEPHONE: (202) 395-2600
FAX: (303) 395-2601

May 16, 2001

Mr. Randy Sturgeon, 3HS23
Remedial Project Manager
U.S. EPA, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

RE: South Landfill Permeable Reactive Barrier Wall Remedy

Dear Randy,

DNREC-SIRB has reviewed the proposal for the above referenced remedy in lieu of the alternatives selected in the ROD and ESD. DNREC-SIRB believes that the treatment technology proposed for the metals migrating from the landfill to be feasible. Of greatest concern in this type of remedy is the wall life and break through potentials. With appropriate precautions considered in design and monitoring after installation, these concerns are greatly minimized. Further, DNREC-SIRB believes that metals treatment by the technology can protect the Christina River from further degradation.

Sincerely,

A handwritten signature in black ink, appearing to read "Kurt D. Olinger".

Kurt D. Olinger
Environmental Scientist

Delaware's good nature depends on you!